

Remarks

Reconsideration of the subject application, as amended, is respectfully requested.

Status of the Claims

Claims 1-26 are pending in the subject application. The Examiner has allowed claims 12-14 and 19; and objected to claims 8-10 and 17 as being dependent upon a rejected base claim, and indicated that they would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims. Applicant gratefully acknowledges the Examiner's indication of the allowed and allowable claims.

Claims 1-7, 11, 15, 16, 18, and 20-26 stand rejected.

The Invention of the Rejected Claims

The claims of the subject application are directed to a voice coil actuator having a core, a permanent magnet, a moving coil, and a compensating coil. Among the limitations recited in the rejected claims is that the compensating coil has a magneto-motive force which is controlled as a function of a position of the moving coil. Thus, in accordance with the claimed invention, there is a moving-coil-position versus magneto-motive-force relationship of the magneto-motive force provided by the compensating coil, and the magneto-motive force that is provided by the compensating coil is controlled by this relationship. Thus, for example, depending upon the force versus stroke characteristic desired from the actuator, the current supplied to the compensating coil is adjusted with the stroke (using position feedback, for example) to control the magneto-motive force provided by the compensating coil as a function of the position of the moving coil. See, p. 1, line 29 through p. 2, line 3; p. 4, lines 8-14; p. 4, line 24 to p. 6, line 8; and Figs. 3-7, of the subject specification.

The Official Action35 USC 101 Rejection

The Examiner has rejected claims 18 and 20 under 35 USC 101 on the grounds that it would be impossible to build such a device, stating:

Applicant is claiming an open-ended actuator having first and second cavities between two ends of a permanent magnet and the core. As can be seen from Applicant's figure 2, there is no place for a second cavity.

See, Official Action, p. 2. Applicant respectfully traverses this rejection.

It is respectfully submitted that the spaces at either end of permanent magnet 18 correspond to the first and second cavities in one open-ended embodiment of the present invention. As defined in the online Merriam-Webster Dictionary at <http://www.m-w.com/cgi-bin/dictionary>, the word "cavity" means:

"1 : an unfilled space within a mass; especially : a hollowed-out space"

It is therefore respectfully submitted that the spaces at the ends of permanent magnet 18 are cavities within the ordinary meaning of the word. See also p. 5, line 18, where regions 14 and 16 are referred to as "spaces." That these spaces are the "cavities" referred to in claims 18 and 20 is further supported in the specification, at p. 4, lines 15-16, where it is stated that

"The open-ended embodiment of Fig. 2 is similar to that of Fig. 1, except that one end of the field blank is open."

Further, as discussed below in connection with new drawing Fig. 8, the first and second cavities (or spaces) in the open-ended version of the subject invention are specifically shown therein.

For these reasons, it is respectfully submitted that the claimed device of claims 18 and 22 is operable, and the Examiner's withdrawal of this above ground for rejections is respectfully requested.

35 USC 102 Rejection

Claims 1-4, 15, 21, 23 and 24 have been rejected under 35 USC 102(b) as being anticipated by Helms 3,619,673. The Examiner has taken the position that:

Helms discloses a voice coil actuator having a core 20, a permanent magnet 36, 38, a moving coil 50 and a compensating coil 70 as shown in figure 2 wherein the compensating coil interacts with the moving coil as a function of the position of the moving coil as described in column 4 lines 30-54.

The Examiner also referred to figure 2 for his rejection of claims 3, 4 and 24; and to figure 1 for his rejection of claims 15 and 21. See Official Action, p. 2. Applicant respectfully traverses this rejection.

As understood by Applicant, Helms teaches a "brush type" device which is fundamentally different from the claimed invention. As can be seen from Helm's figure 2, brushes 72 and 74 are used to provide a moveable electrical contact to the bucking coil 70. The result of such a configuration is that only a portion of the bucking coil 70 is energized as the position of the moving coil is changed, with the remainder of the bucking coil 70 being unenergized. Helm's use of only a portion of the bucking coil 70 at any one time is consistent with Helm's goal for using the bucking coil 70 – to minimize the drive coil inductance. (See, Helms, col. 4, line 20.)

This minimizing of the drive coil inductance in Helms by energizing only a portion of the bucking coil 70, clearly does not teach the limitation of claim 1 in the subject application of a

a compensating coil positioned to interact with the moving coil, wherein a magneto-motive force in the compensating coil is controlled as a function of a position of the moving coil.

First of all, only a portion of bucking coil 70 is energized at any one time, therefore it cannot be said that Helms controls a force "in the compensating coil" as recited in claim 1. That is, in Helms, the bucking coil 70 is not energized, only portions of it are energized, which portions are different depending upon the location of the moving coil.

Second, rather than "controlling" force in the bucking coil as a matter of position of the drive coil, Helms teaches changing the location at which a force is generated along selected windings of the bucking coil. Thus, the position of Helm's drive coil determines the location of the energized portion of the bucking coil. In contrast, claim 1 of the subject application requires that the "magneto-motive force in the compensating coil is controlled as a function of a position of the moving coil." Examples of such force versus position control are provided in Figs. 3-7 of the subject application. This force versus position control relationship is not taught in Helms, particularly in view of the operative goal of the Helm's configuration – to minimize drive coil inductance. (Helms, col. 4, line 20.)

Independent claims 2 and 23 of the subject application have a similar compensating coil limitation and are therefore similarly allowable over Helms. Claim 23 in particular recites that the magnitude of the magneto-motive force produced in the compensating coil is a function of positions on the moveable coil. Helms does not teach such a feature. Claims 3, 4, 15, and 24 as dependent from allowable base claims 1 or 2 or 23 are therefore also allowable.

35 USC 103 Rejection

The Examiner has rejected claims 5, 6, 22, 25 and 26 under 35 USC 103(a) as being unpatentable over Helms in view of Gillott et al. USP 3,863,082; rejected claim 7 under 35 USC 103(a) as unpatentable over Helms as modified by Gillott et al., and further in view of Sim USP 5,177,383; rejected claim 11 based on Helms in view of Morcos USP 5,677,963; and rejected claim 16 based upon Helms in view of Yuan USP 5,777,403. Applicant respectfully traverses these rejections.

The Examiner recognizes that Helms does not disclose a permanent magnet positioned with respect to the core to define a cavity where a compensating coil is positioned, and attempts to rely on Gillott figure 1 for such teaching. The Examiner also attempts to justify the combination of Gillott et al. with Helms stating:

While Gillott et al controls his compensating coil based on the time dependent pressure build-up in a patient's lungs as described in column 7, lines 51-62, the purpose of both compensating coils is the same as

described in Helms column 4 lines 20-29 and Gillott et al. column 7, lines 16-26. (Helms refers to a bucking coil which reduces the net flux in leg 28, and Gillot (sic) et al. refers to an auxiliary coil where the direction and magnitude of current flow can be varied to add flux to take the core out of saturation.)

However, these points only serve to further highlight the differences between Helm/Gillot et al. compared to the invention recited in claims 5, 6, 22, 25 and 26. Neither Helm nor Gillott et al. control the magneto-motive force in a compensating coil as a function of position of the moving coil of the actuator. As pointed out by the Examiner, Gillott et al. controls his auxiliary coil "based on the time dependent pressure build-up in a patient's lungs." See Gillott et al. figure 5 where there is not even a hint of control based on moving coil position. Gillott et al. clearly does not control as a function of the position of a moving coil of the actuator.

In fact, the Examiner's statement that "the purpose of both compensating coils is the same as described in Helms column 4 lines 20-29 and Gillott et al. column 7, lines 16-26" suggests that hindsight may be at work in the Examiner's reasoning that the coils of Helms and Gillott et al. serve the same purpose. Clearly the operation of Helm's bucking coil for minimizing drive coil inductance (col. 4, line 20) is different from Gillott et al.'s auxiliary coil for controlling time-pressure build up in a patient's lungs. Therefore, not only is there an absence in either Helms or Gillott et al. of the control of force in a compensating coil as a function of the position of the moving coil, the clear differences in the purpose of Helms bucking coil versus Gillott et al.'s auxiliary coil teaches away from combining Helms with Gillott et al.

Thus, it is respectfully submitted that the combination of Helms and Gillott et al. is improper, and further will not result in the claimed devices of claims 5, 6, 22, 25 and 26.

As to the Examiner's rejection of claim 7 under 35 USC 103(a) as unpatentable over Helms as modified by Gillott et al., and further in view of Sim USP 5,177,383, it is respectfully submitted that because the underlying combination of Helms and Gillott et al. is improper and would not result in the claimed device with controlled compensating coil, the addition of Sim cannot remedy the defects in the underlying combination.

Further, it is clear from a review of Sim, col. 3, lines 36-39, and Fig. 7, that the coils 50

taught in Sim are "shorted coils" which are wound around yoke 10 rather than being compensating coils positioned in cavities at the ends of the permanent magnet.

As to the rejection of claim 11 based on Helms in view of Morcos USP 5,677,963, and of claim 16 based upon Helms in view of Yuan USP 5,777,403, it is respectfully submitted that because Helms lacks the compensating coil in which "magneto-motive force in the compensating coil is controlled as a function of a position of the moving coil" as set forth in base claims 1 or 2, the combination of Helms and Morcos (or Helms and Yuan) would be improper, and would not result in the claimed device.

Helms simply does not teach controlling a power supply connected to a compensating coil as a function of position of the moving coil. Thus, there would be no motivation or need for a position sensor of Morcos et al. to be used in the device of Helms.

Helms simply does not teach a compensating coil in which "magneto-motive force in the compensating coil is controlled as a function of a position of the moving coil." Thus, even if Helms was converted to an open ended device in view of Yuan, the resulting combination would still lack the above compensating coil feature.

For these foregoing reasons, it is respectfully submitted that rejected claims 1-7, 11, 15, 16, 18, and 20-26 are allowable, and the Examiner's indication to that end is respectfully solicited.

Objection to the Drawings:

By this amendment, although Applicant believes them unnecessary, Applicant proposes to add new drawings 8-10 which show the features required by the Examiner to be shown, and which do not add new matter. The Examiner has objected to the drawings as not showing the first and second cavities recited in claims 18 and 20, as not showing the cylindrical shaped actuator recited in claim 22, and the rectangular shaped actuator recited in claims 21 and 26.

Notwithstanding Applicant's belief that Fig. 2 shows the first and second cavities of claims 18 and 22, Applicant proposes new Fig. 8 in which the first and second spaces (or cavities) are explicitly labeled with reference numbers 14,16, respectively, and in which compensating coil 10-C is shown positioned in space 16. Support for proposed

new Fig. 8 is found throughout the specification and drawings, for example in the above cited passages and figures, therefore it is respectfully submitted that no new matter is added by proposed new Fig. 8.

As to the Examiner's requirement that cylindrical and rectangular shaped actuators be shown in the figures, it is respectfully submitted that one of ordinary skill in the art would understand from the cross sectional drawings of Figs. 1 and 2 what the cylindrical and rectangular shaped actuators of the claimed invention would look like. Notwithstanding this belief, Applicant proposes new Figs. 9 and 10 which are simplified cross sectional drawings taken transverse to the direction of motion of the actuator. From these drawings the rectangular and cylindrical shapes of the actuator can be seen. It is respectfully submitted that no new matter is introduced by these proposed Figs. 9 and 10, particularly because they merely show from a different view what is already shown in Figs. 1 and 2 and described in the description of the subject application.

For the above reasons, approval of new Figs. 8-10 is respectfully requested.

Amendments to the Specification

In light of the proposed addition of new drawings 8-10, the specification has been amended at p. 2, line 23, to add brief descriptions of these figures to the "Description of the Drawings" section. Also, at p. 3, line 19, a paragraph has been added which refers to Figs. 9 and 10 as illustrating the rectangular and cylindrical configurations of the actuator. Finally, the paragraph at page 4, lines 15-16, has been amended to make reference to Fig. 8 and its illustration of spaces 14 and 16 in which compensating coils 10-B and 10-C are positioned. Support for these amendments to the subject specification can be found in the same passages and figures referred to in the previous section regarding the proposed new figures.

Objected-to Claims 8-10 and 17 (and New Claims 27-31):

As to objected-to claims 8-10 and 17, claims 8 and 10 have been rewritten in independent form including the limitations of the base claim and intervening claims. Original objected-to claim 8 included intervening claim 3, which was multiply dependent

upon base claims 1 or 2, and claim 1 was selected as the base claim for rewritten claim 8. Original objected-to claim 9(8→4→3→1) remains unchanged because it now depends from an allowable base claim. Original claim 10 included intervening claim 5, which was multiply dependent upon base claims 1 or 2, and claim 1 was selected as the base claim for rewritten claim 10. Original objected to claim 17(10→7→5→1) remains unchanged because it now depends from an allowable base claim.

New claims 27 through 31 have been added by the subject amendment. The original dependency of claims 8 and 10 on base claim 2, which is no longer present in rewritten claims 8 and 10, is preserved by new claims 27 and 31. These claims correspond to rewritten versions of the objected to claims as follows:

Objected to Claim	Corresponding Rewritten Claim
8(4→3→2)	27
9(8→4→3→2)	28
10(7→5→2)	29
17(10→7→5→2)	30
18(10→7→5→2)	31

New claim 31 corresponds to original claim 18(10→7→5→2). This claim was rejected under 35 USC 101 as being impossible to build. See p. 2 of the Official Action. As set forth above, the claimed subject matter is possible to build, in particular because the features highlighted by the Examiner – first and second cavities – can, and in fact do, exist in open ended embodiments of the present invention.

For the foregoing reasons, it is respectfully submitted that new claims 27 to 31 are allowable.

Conclusion

For the above reasons, it is respectfully submitted that the claims now pending in the subject application are allowable, and the Examiner's indication to that end is respectfully solicited.

The amendments to the specification and claims are indicated in the attached section entitled Version with Markings to Show Changes."

Respectfully Submitted,
GRAY CARY WARE & FREIDENRICH LLP

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By: Gerald T. Sekimura
Gerald T. Sekimura
Reg. No. 30,103

Attorneys for Applicants



VERSION WITH MARKINGS TO SHOW CHANGES

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In the Specification

Three new paragraphs were added to the specification following p. 2, line 23.

A new paragraph was inserted in the specification following p. 3, line 19

The paragraph at p. 4, lines 15-16 of the subject specification has been modified to read as follows:

The open-ended embodiment of Fig. 2 is similar to that of Fig. 1, except that one end of the field blank is open. Fig. 8 illustrates an open-ended embodiment of the present invention in which compensating coils 10-B and 10-C are positioned in spaces 14 and 16.

In the Claims

Claims 8 and 10 have been amended to place them in independent form, using claim 1 as the base claim, as follows:

8. (Amended) [The actuator of claim 4,] A voice coil actuator comprising
a core having an axis;
a permanent magnet having a longitudinal axis, and positioned so that the
longitudinal axis of the permanent magnet is substantially parallel to the axis of
the core;
a moving coil positioned to interact with the permanent magnet along the
axis of the core; and
a compensating coil positioned to interact with the moving coil, wherein a
magneto-motive force in the compensating coil is controlled as a function of a
position of the moving coil;
wherein the compensating coil is positioned about the core;
wherein the compensating coil extends along substantially the entire
length of the core; and

wherein the permanent magnet is positioned with respect to the core to define a cavity between the core and an end of the permanent magnet; and further wherein a second compensating coil is positioned in the cavity.

10. (Amended) [The actuator of claim 7,] A voice coil actuator comprising
a core having an axis;
a permanent magnet having a longitudinal axis, and positioned so that the
longitudinal axis of the permanent magnet is substantially parallel to the axis of
the core;
a moving coil positioned to interact with the permanent magnet along the
axis of the core; and
a compensating coil positioned to interact with the moving coil, wherein a
magneto-motive force in the compensating coil is controlled as a function of a
position of the moving coil;
wherein the permanent magnet is positioned with respect to the core to
define a cavity between the core and an end of the permanent magnet; and
further wherein the compensating coil is positioned in the cavity;
wherein a second cavity is defined at another end of the permanent
magnet between the permanent magnet and the core, and further wherein a
further compensating coil is positioned in the second cavity;
further including a core compensating coil positioned about the core.

New claims 27 through 31 have been added which are independent forms of objected to original claims 8(4→3→2), 9(8→4→3→2), 10(7→5→2), 17(10→7→5→2), and 18(10→7→5→2), respectively.

In the Drawings

New Figs. 8, 9 and 10 have been proposed, as attached hereto.